

REMARKS

Claims 1-17 are pending in the present application. Claims 1-17 have been rejected. New claims 18-20 have been added. The support for new claims 18-20 can be found in the specification, for example, on page 8, lines 8-16. No new matter is added by the amendment.

Claim Rejections under 35 U.S.C. 102:

Claims 1, 3-7, 14 and 17 have been rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,338,363 to Kawata et al (hereinafter "Kawata"). In response, Applicant respectfully submits that the rejection of these claims under 35 U.S.C. 102(b) may not be maintained because each and every element set forth in claim 1 is not found in the Kawata.

Claim 1 recites a thin film deposition reactor comprising, *inter alia*, a reactor block, a shower head plate, a wafer block, an exhausting portion, first and second connection lines in communication with the shower head plate, through which first and second reaction gases and/or inert gases flow, respectively, a diffusion plate mounted on a lower surface of the shower head plate in which the diffusion plate includes a plurality of nozzles which are in communication with the second connection line and extend toward the inner side surface of the reactor block to spray the second reaction gas and/or inert gas toward edges of the wafer.

In claim 1, the first and second connection lines independently supply the first and second reaction gases and/or inert gases into the reactor, and the first and second reaction gases and/or inert gases are diffused on a wafer without being mixed each other. Thus, the thin film deposition reactor of claim 1 may deposit the first and second reaction gases on the wafer with an ALD (Atomic Layer Deposition) process. On the contrary, the Kawata diffuses reaction gases with a CVD process. As shown in Fig. 10 of the Kawata, the Kawata mixes the reaction gases: SiH₄ and O₂ in a gas mixing chamber 17 to diffuse a mixed gas on a wafer. Thus, the

Kawata neither discloses nor suggests a first connection line in communication with the shower head plate, through which a first reaction gas and/or inert gas flow, and a second connection line in communication with the shower head plate, through which a second reaction gas and/or inert gas flow, as claimed in claim 1.

Further, the Kawata does not disclose or suggest a diffusion plate having a plurality of nozzles extending toward the inner side surface of the reactor block to spray the second reaction gas and/or inert gas toward edges of the wafer, as recited in claim 1. An inert gas injection hole (25) of the Kawata is not the plurality of nozzles of claim 1. The inert gas injection hole (25) is directed toward an opening of an exhaust passage 13 to discharge a reaction by product contained in an exhaust gas (See, col. 8, ll. 64-68 and col. 9, ll. 63-66).

Thus, the Kawata neither discloses nor suggests that a diffusion plate mounted on a lower surface of the shower head plate, the diffusion plate having a plurality of spray holes which are in communication with the first connection line and face the upper surface of the wafer to spray the first reaction gas and/or inert gas onto the wafer, and a plurality of nozzles which are in communication with the second connection line and extend toward the inner side surface of the reactor block to spray the second reaction gas and/or inert gas toward edges of the wafer, as claimed in claim 1.

Accordingly, the Kawata neither discloses nor suggests a first connection line in communication with the shower head plate, through which a first reaction gas and/or inert gas flow; a second connection line in communication with the shower head plate, through which a second reaction gas and/or inert gas flow; and a diffusion plate mounted on a lower surface of the shower head plate, the diffusion plate having, ..., a plurality of nozzles which are in communication with the second connection line and extend toward the inner side surface of the reactor block to spray the second reaction gas and/or inert gas toward edges of the wafer, as

claimed in claim 1. Therefore, Applicant respectfully requests reconsideration and withdrawal of the rejection of claim 1 under 35 U.S.C. 102(b).

Claims 3-7, 14 and 17 and new claims 18-20 depend from claim 1, and are believed to be allowable at least due to their dependency on claim 1. Accordingly, Applicant respectfully requests that claims 1, 3-7, 14 and 17-20 be passed to issue.

Claim Rejections – 35 U.S.C. 103:

Claims 2, 8-13 and 16 have been rejected under 35 U.S.C. 103(a) as being unpatentable.

To establish a prima facie case of obviousness, all the limitations of the claimed invention must be disclosed or suggested in the prior art, and there must be a reasonable expectation of success in combining the teachings of the prior art references. Further, there should be a suggestion or motivation to combine or modify the references to make the claimed invention in the references themselves or in the knowledge generally available to one of ordinary skill in the art.

It is respectfully submitted that at the very minimum, combinations of references cited by the Examiner do not establish a prima facie case of obviousness against claims 2, 8-13 and 16.

Claim 2

Claim 2 has been rejected under 35 U.S.C. 103(a) as being unpatentable over the Kawata in view of U.S. Patent No. 5, 439,524 to Cain et al (hereinafter "Cain"). The Examiner states that it would be obvious to provide a diffusion plate with a concave form of the Cain in the Kawata.

As discussed above with the Kawata to the rejection made under 35 U.S.C. 102, the Kawata fails to disclose or teach that a first connection line in communication with the shower

head plate, through which a first reaction gas and/or inert gas flow; a second connection line in communication with the shower head plate, through which a second reaction gas and/or inert gas flow; and a diffusion plate mounted on a lower surface of the shower head plate, the diffusion plate having, ..., a plurality of nozzles which are in communication with the second connection line and extend toward the inner side surface of the reactor block to spray the second reaction gas and/or inert gas toward edges of the wafer, as recited in claim 1.

The Cain discloses a plasma processing apparatus in which a fluid distribution head having a non-planar dispersion plate is provided. The fluid distribution head of the Cain includes one fluid inlet pipe (44 in Fig. 2 of the Cain) and no nozzle. Thus, the Cain fails to suggest or teach that a first connection line in communication with the shower head plate, through which a first reaction gas and/or inert gas flow; a second connection line in communication with the shower head plate, through which a second reaction gas and/or inert gas flow; and a diffusion plate mounted on a lower surface of the shower head plate, the diffusion plate having, ..., a plurality of nozzles which are in communication with the second connection line and extend toward the inner side surface of the reactor block to spray the second reaction gas and/or inert gas toward edges of the wafer, as recited in claim 1. Accordingly, the Cain does not cure a deficiency of the Kawata, and a combination of the Cain and the Kawata does not render obvious claim 1.

Claim 2 depends from claim 1, and is believed to be allowable at least due to its dependency on claim 1. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection of claim 2 under 35 U.S.C. § 103(a).

Claims 8, 9 and 12

Claims 8, 9 and 12 have been rejected under 35 U.S.C. 103(a) as being unpatentable over

the Kawata in view of U.S. Patent No. 5,976,261 to Moslehi et al (hereinafter "Moslehi"). The Examiner states that it would be obvious to vary the diameter and the number of spray holes in the Kawata in order to optimize flow control and uniformity as taught by the Moslehi.

The Moslehi discloses a programmable multi-zone showerhead for ultraclean controlled injection of multiple process gases into a fabrication equipment process chamber. The Moslehi does not suggest or teach that a diffusion plate having a plurality of nozzles extending toward the inner side surface of the reactor block to spray the second reaction gas and/or inert gas toward edges of the wafer. Thus, the Moslehi does not cure the deficiency of the Kawata.

Since both the Kawata and the Moslehi fail to suggest or teach that a first connection line in communication with the shower head plate, through which a first reaction gas and/or inert gas flow; a second connection line in communication with the shower head plate, through which a second reaction gas and/or inert gas flow; and a diffusion plate mounted on a lower surface of the shower head plate, the diffusion plate having, ..., a plurality of nozzles which are in communication with the second connection line and extend toward the inner side surface of the reactor block to spray the second reaction gas and/or inert gas toward edges of the wafer, as recited in claim 1, a combination of the Kawata and the Moslehi does not render obvious claim 1.

Claims 8, 9 and 12 depend from claim 1, and are believed to be allowable at least due to their dependency on claim 1. Thus, Applicant respectfully requests reconsideration and withdrawal of the rejection of claims 8, 9 and 12 under 35 U.S.C. § 103(a).

Claim 10

Claim 10 has been rejected under 35 U.S.C. 103(a) as being unpatentable over the Kawata in view of U.S. Patent No. 5,425,812 to Tsutahara et al (hereinafter "Tsutahara"). The

Examiner states that it would be obvious to provide a spray hole configuration in the Kawata comprising a larger diameter upper portion and a smaller diameter lower portion with a step portion formed in between in order to maintain blowout flow from each hole at a constant rate, supply thoroughly diffused gas to the surface of the wafer and prevent drifting of the flow as taught by the Tsutahara.

The Tsutahara discloses a reaction chamber for a chemical vapor deposition apparatus for achieving an improved uniform film deposition of high accuracy. An inner room (63a in Fig. 13) of the Tsutahara includes a mixer (39 in Fig. 13) for mixing reaction gases. Thus, the Tsutahara neither teaches or suggests first and second connection lines for independently supplying first and second reaction gases to a reactor. Further, the Tsutahara neither suggests nor teaches a plurality of nozzle extending toward the inner side surface of the reactor block to spray the second reaction gas and/or inert gas toward edges of the wafer. Thus, the Tsutahara does not cure the deficiency of the Kawata.

Since both the Kawata and the Tsutahara fail to suggest or teach that a first connection line in communication with the shower head plate, through which a first reaction gas and/or inert gas flow; a second connection line in communication with the shower head plate, through which a second reaction gas and/or inert gas flow; and a diffusion plate mounted on a lower surface of the shower head plate, the diffusion plate having, ..., a plurality of nozzles which are in communication with the second connection line and extend toward the inner side surface of the reactor block to spray the second reaction gas and/or inert gas toward edges of the wafer, as recited in claim 1, a combination of the Kawata and the Tsutahara does not render obvious claim 1.

Claim 10 depends from claim 1, and is believed to be allowable at least due to its dependency on claim 1. Thus, Applicant respectfully requests reconsideration and withdrawal

of the rejection of claim 10 under 35 U.S.C. § 103(a).

Claim 11

Claim 11 has been rejected under 35 U.S.C. 103(a) as being unpatentable over the Kawata and the Tsutahara in view of Japanese Patent No. 09316644 to Arai et al (hereinafter "Arai"). The Examiner states that it would be obvious to provide a diffusion plate with a thickness of 5mm in the Kawata and the Tsutahara in order to obtain a thin film of good quality in a short time as taught by the Arai.

The Arai discloses a shower head nozzle of CVD device having a heat exchanging means and having a predetermined thickness to improve a film forming rate without deteriorating a film quality. However, the Arai does not teach or suggest that first and second connection lines and a diffusion plate having a plurality of nozzles extending toward the inner side surface of the reactor block to spray the second reaction gas and/or inert gas toward edges of the wafer. Thus, the Arai does not cure the deficiency of the Kawata and the Tsutahara in individual or combination.

As discussed above with the Kawata and the Tsutahara to the rejection of claim 10, the combination of the Kawata and the Tsutahara fails to suggest or teach that a first connection line in communication with the shower head plate, through which a first reaction gas and/or inert gas flow; a second connection line in communication with the shower head plate, through which a second reaction gas and/or inert gas flow; and a diffusion plate mounted on a lower surface of the shower head plate, the diffusion plate having, ..., a plurality of nozzles which are in communication with the second connection line and extend toward the inner side surface of the reactor block to spray the second reaction gas and/or inert gas toward edges of the wafer, as recited in claim 1. Thus, a combination of the Kawata, the Tsutahara, and the Arai does not

render obvious claim 1.

Claim 11 depends from claim 1, and is believed to be allowable at least due to its dependency on claim 1. Thus, Applicant respectfully requests reconsideration and withdrawal of the rejection of claim 11 under 35 U.S.C. § 103(a).

Claim 13

Claim 13 has been rejected under 35 U.S.C. 103(a) as being unpatentable over the Kawata in view of U.S. Patent No. 5,076,207 to Washitani et al (hereinafter "Washitani"). The Examiner states that it would be obvious to allow a distance of 20 to 50mm between the diffusion plate and the wafer block in the Kawata in order to obtain a satisfactory film forming speed and a high degree of surface uniformity as taught by the Washitani.

The Washitani discloses an atmospheric CVD apparatus. The Washitani does not suggest or teach first and second connection lines for independently supplying first and second reaction gases with a ALD process and a diffusion plate having a plurality of nozzles extending toward the inner side surface of the reactor block to spray the second reaction gas and/or inert gas toward edges of the wafer. Thus, the Washitani does not cure the deficiency of the Kawata.

Since both the Kawata and the Washitani fail to suggest or teach that a first connection line in communication with the shower head plate, through which a first reaction gas and/or inert gas flow; a second connection line in communication with the shower head plate, through which a second reaction gas and/or inert gas flow; and a diffusion plate mounted on a lower surface of the shower head plate, the diffusion plate having, ..., a plurality of nozzles which are in communication with the second connection line and extend toward the inner side surface of the reactor block to spray the second reaction gas and/or inert gas toward edges of the wafer, as recited in claim 1, a combination of the Kawata and the Tsutahara does not render obvious claim

1.

Claim 13 depends from claim 1, and is believed to be allowable at least due to its dependency on claim 1. Thus, Applicant respectfully requests reconsideration and withdrawal of the rejection of claim 13 under 35 U.S.C. § 103(a).

Claim 16

Claim 16 has been rejected under 35 U.S.C. 103(a) as being unpatentable over the Kawata in view of the Arai. The Examiner states that it would be obvious to provide a diffusion plate with a thickness of 5mm in the Kawata in order to obtain a thin film of good quality in a short time as taught by the Arai.

As discussed above with regard to the rejection of claim 11, both the Kawata and the Aria fail to suggest or teach that a first connection line in communication with the shower head plate, through which a first reaction gas and/or inert gas flow; a second connection line in communication with the shower head plate, through which a second reaction gas and/or inert gas flow; and a diffusion plate mounted on a lower surface of the shower head plate, the diffusion plate having, ..., a plurality of nozzles which are in communication with the second connection line and extend toward the inner side surface of the reactor block to spray the second reaction gas and/or inert gas toward edges of the wafer, as recited in claim 1, and thus the combination of the Kawata and the Aria does not render obvious claim 1.

Claim 16 depends from claim 1, and is believed to be allowable at least due to its dependency on claim 1. Thus, Applicant respectfully requests reconsideration and withdrawal of the rejection of claim 16 under 35 U.S.C. § 103(a).

New Claims 18-20

New claims 18-20 depend from claim 1, and are believed to be allowable over the Kawata, the Cain, the Moslehi, the Tsutahara, the Washitani, and the Arai in individual or combination under 35 U.S.C. § 103(a), at least due to their dependency on claim 1. Thus, Applicant respectfully requests that new claims 18-20 be passed to issue.

Conclusion

In conclusion, as the present invention is not anticipated by or obvious from the Kawata, the Cain, the Moslehi, the Tsutahara, the Arai, and the Washitani in individual or combination, it is respectfully requested that claims 1-20 be passed to issue. The remaining references, although not cited as prior arts, were found to be less relevant and therefore no further discussion is required.

It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims, as amended herein, are now allowable to Applicant. Thus, reconsideration and allowance are respectfully requested.

The Examiner is invited to contact Applicant's attorneys at the below-listed phone number with any questions. If there are any charges due with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130 maintained by Applicant's attorneys.

Respectfully submitted,

CANTOR COLBURN LLP

By: 

Daniel F. Drexler

Registration No. 47,535

CANTOR COLBURN LLP

55 Griffin Road South

Bloomfield, CT 06002

Tel: 860-286-2929

Customer No. 23413

Date: 12-09-02